FORM PTO-1390 (Modified) (REV 10-95) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER	U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR
705/71502-2/8036	09/194562

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/SE97/000905	May 27, 1997	May 29, 1996

TITLE OF INVENTION

A DEVICE IN THE STATOR OF A ROTATING ELECTRIC MACHINE AND SUCH A MACHINE

APPLICANT(S) FOR DO/EO/US

Mats LEIJON et al.

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☐ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
   a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☒ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☐ A copy of the International Search Report (PCT/ISA/210).
8. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☒ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☐ have not been made and will not be made.
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☒ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 13 to 18 below concern document(s) or information included:

13. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
    A **SECOND** or **SUBSEQUENT** preliminary amendment.
16. ☐ A substitute specification.
17. ☐ A change of power of attorney and/or address letter.
18. ☐ Certificate of Mailing by Express Mail
19. ☒ Other items or information:

WO 97/47067

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
	PCT/SE97/000905	705/71502-2/8036

20. The following fees are submitted:.

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :

		CALCULATIONS PTO USE ONLY
☐	Search Report has been prepared by the EPO or JPO	**$930.00**
☐	International preliminary examination fee paid to USPTO (37 CFR 1.482)	**$720.00**
☐	No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2))	**$790.00**
☒	Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2) paid to USPTO	**$1,070.00**
☐	International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4)	**$98.00**

ENTER APPROPRIATE BASIC FEE AMOUNT =	**$1,070.00**	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☒ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).	**$130.00**	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	18 - 20 =	0	x $22.00	**$0.00**	
Independent claims	2 - 3 =	0	x $82.00	**$0.00**	
Multiple Dependent Claims **(check if applicable).**			☐	**$0.00**	
TOTAL OF ABOVE CALCULATIONS =				**$1,200.00**	
Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) **(check if applicable).** ☐				**$0.00**	
SUBTOTAL =				**$1,200.00**	
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)). +				**$0.00**	
TOTAL NATIONAL FEE =				**$1,200.00**	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) **(check if applicable).** ☐				**$0.00**	
TOTAL FEES ENCLOSED =				**$1,200.00**	
				Amount to be: refunded	$
				charged	$

☒ A check in the amount of **$1,200.00** to cover the above fees is enclosed.

☐ Please charge my Deposit Account No. in the amount of to cover the above fees.
A duplicate copy of this sheet is enclosed.

☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. **23-0575** A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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SIGNATURE

John P. DeLuca
NAME

25,505
REGISTRATION NUMBER

November 27, 1998
DATE

705/71502-2/8036

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	PATENT
Mats LEIJON et al.	)	Group: Unknown
Serial No: To be assigned	)	Examiner: Unknown
New appln. based on PCT/SE97/00905	)	
Filed: On Even Date	)	**ATTN: BOX PCT**
A DEVICE IN THE STATOR OF A ROTATING ELECTRIC MACHINE AND SUCH A MACHINE	)	

* * * * * *

PRELIMINARY AMENDMENT

Washington, D.C.
November 27, 1998

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Concurrently with the U.S. national filing of this application, please amend the present application as follows:

IN THE CLAIMS:

Please amend the claims as follows:

Please cancel claim 9 without prejudice.

Please delete all reference numerals in parenthesis.

Claim 1. (Amended) A stator winding [in] for a rotating electric machine having [comprising] a stator , a rotor and air gap therebetween, the stator having end surfaces and [provided with] a plurality of radial slots extending between the end surfaces to hold [a] the winding[,] in layers at different radial distances from the air gap [between the rotor and the stator, characterized in that], the winding [is in the form of] comprising a cable passing [wherein the part of the cable that passes] to and from once through the stator between different layers [forms] forming a corresponding coil [with] having an arc-shaped coil end protruding from each end surface of the stator, [and in that] each of the coils [are] bridging a corresponding number of slots and being divided into coil group parts, [and that] all of the coils in the same coil group part [are] being arranged axially, one outside the other with substantially coinciding centres and with successively increasing diameters, and wherein the number of slots that are bridged by each of the coils successively increasing within the coil group part.

Claim 2. (Amended) A stator winding as claimed in claim 1, wherein the stator has a yoke and [characterized in that] the [coils] cable produces a formation [from the air gap towards the stator yoke since, on] passing from a first one of said [the] first slots to [the] a second one of said slots, and [also] upon returning to the first slot, the cable changes position to a [the] next layer [immediately outside] in a first direction until a number of

positions in the slot have been filled, and said cable then passes to [the] a nearest adjacent slot to form coils that lie [inside or outside] to a side of the cable [in the other] ;and coils included in the coil group are disposed [part] in the same formation.

Claim 3. (Amended) A stator winding as claimed in claim 1, wherein [characterized in that] all of the coils in a coil group part are formed in sequence from the cable, the cable [only] subsequently passing to the next coil group part [to produce the latter.].

Claim 4. (Amended) A stator winding as claimed in claim 1, comprising three [any of claims 1-3, characterized in that the number of] coils in [the] each coil group part [is three].

Claim 5. (Amended) A stator winding as claimed in claim 1, comprising four [any of claims 1-3, characterized in that the number of] coils in [the] each coil group part[s is four].

Claim 6. (Amended) A stator winding as claimed in claim 1, wherein [characterized in that] the coil group parts are arranged in relation to each other in a peripheral direction such that alternate coil group parts [on their way] extending to a radial layer are situated

radially inside the next following coil group part and alternate coil group parts are situated radially outside the next following coil group parts.

Claim 7. (Amended) A stator winding as claimed in claim 6, wherein [characterized in that] the coils are formed by the cable on passing from a first one of said slots to a second one of said slots, and [also] upon returning to the fist slot, changing position to [the] a next adjacent layer, and thereafter passing to the nearest adjacent slot and there filling corresponding positions, until two coil group parts have been formed simultaneously between [altogether] four positions in the relevant slots, whereupon the cable continues [in this way] until [these] the four positions have been filled in all of the slots of the stator.

Claim 8. (Amended) A stator winding as claimed in claim 1, wherein [any of claims 1-7 characterized in that] a pressure-distributing and wear-preventing curable compound is located [provided] between the portions of cable[s] in the coil ends [package].

Claim 10. (Amended) A rotating electric machine as claimed in claim 9, wherein [characterized in that] the winding comprises at least one [or more] current-carrying conductor[s , wherein] , a first layer having semi-conducting properties [is arranged]

around the [each] conductor, an [a permanently] insulating layer [is arranged] around the first layer, and a second layer having semi-conducting properties [is arranged] around the insulating layer.

Claim 11. (Amended) A rotating electric machine as claimed in claim 10, wherein [characterized in that] the first layer is at a potential substantially the same [potential] as the conductor.

Claim 12. (Amended) A rotating electric machine as claimed in claim 10, wherein [or claim 11, characterized in that] the second layer [is arranged in such a manner that it constitutes] formes a substantially [an] equipotential surface surrounding the at least one conductor[s].

Claim 13. (Amended) A rotating electric machine as claimed in claim 12, wherein [characterized in that] the second layer is adapted to be connected to a selected [special] potential.

Claim 14. (Amended) A rotating electric machine as claimed in claim 13, wherein [characterized in that] the [special] selected potential is earth potential.

Claim 15. (Amended) A machine as claimed in claim 10, wherein [any of claims 10-14, characterized in that] at least two of said layers have substantially the same coefficient of thermal expansion.

Claim 16. (Amended) A rotating electric machine as claimed in claim 10, wherein [any of claims 10-15, characterized in that] the current-carrying conductor comprises a selected number of strand parts, [only] and a selected fewer number [few] of the strand parts are non-insulated [not being insulated] from each other.

Claim 17. (Amended) A rotating electric machine as claimed in claim 10, wherein [any of claims 10-16, characterized in that] each of said [three] layers is permanently connected to the layer adjacent thereto [layers along essentially its entire continuous surface].

Claim 18. (Amended) A rotating electric machine with a magnetic circuit for high voltage wherein the magnetic circuit comprises a magnetic core and a layered winding[, characterized in that the winding consists of] in the form of a cable comprising at least one [or more current-carrying] conductor[s] , each conductor [consisting of] including a number of strand parts, an inner semi-conducting layer [being arranged] around each

conductor, an insulating layer [of permanent insulation being arranged] around the semi-conducting layer, and a semiconducting layer [being arranged] around the insulating layer, the cable being continuously threaded in the stator in a plurality of planar layers formed with concentric end winding portions.

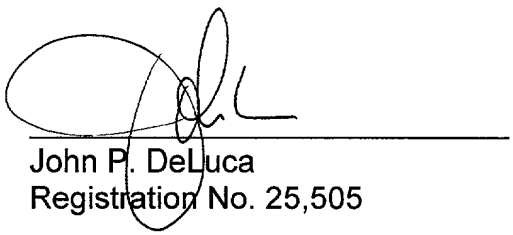
Claim 19. (Amended) A rotating electric machine with magnetic circuit for high voltage as claimed in claim 18, wherein [characterized in that] the cable [is also provided with] includes an outer metal screening and a sheath.

Please delete all multiple dependencies. If any multiple dependencies remain in the claims, it is respectfully requested that said multiple dependencies be deleted and reference be made to the immediately preceding claim.

REMARKS

This Preliminary Amendment is filed for the purpose of conforming the claims to U.S. practice and for deleting multiple dependencies and reference numerals. Entry and allowance of the claims is earnestly solicited.

Respectfully submitted,



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A DEVICE IN THE STATOR OF A ROTATING ELECTRIC MACHINE AND SUCH A MACHINE

The present invention relates to the area of rotating electric machines such as synchronous machines, and also dual-fed machines, applications in asynchronous static current converter cascades, outerpole machines and synchronous flow machines and is intended to be used at high voltages, by which is implied electric voltages in excess of 10 kV. A typical operating range for the machine according to the invention may be from 36 to 800 kV.

The invention relates to a stator winding in a rotating electric machine of the type defined in the preamble to claim 1.

Since the stator winding in the machine, according to the invention, consists of high-voltage insulated electric conductors, in the following termed cables, with permanent insulation similar to that used in cables for transmitting electric power (e.g. PEX cables), the voltage of the machine may be increased to such levels that it may be connected directly to the power network without an intermediate transformer. These voltage levels reaching the level of the power network may be in the range of 130-400 kV and up to 800 kV or higher. This enables the elimination of the step-up transformer and a high-current breaker, thereby enabling lower total plant cost.

It is known to manufacture coils for rotating machines for a voltage range of 10-20 kV.

However, attempts at developing a generator for voltages higher than this have been in progress for some time, as is evident from "Electrical World", October 15 1932, pages 524-525, for instance. This describes how a generator designed by Parson 1929 was constructed for 33 kV. A generator in Langerbrugge, Belgium, is also described which produced a voltage of 36 kV. Although the article also speculates on the possibility of increasing the voltage levels, development of the concepts upon which these generators were based ceased. This was primarily due to deficiencies in the insulating system where several layers of varnish-impregnated mica foil and paper were used.

In A report from the Electric Power Research Institute, EPRI, EL-3391, from April 1984 an exposition is given of the generator concept in which a higher voltage is achieved in an electric generator with the object of being able to connect such a generator to a power network without intermediate transformers. The report deems such a solution to offer satisfactory gains in efficiency and financial advantages. The main reason that in 1984 it was considered possible to start developing generators for direct connection to the power network was that by that time a superconducting rotor had been developed. The considerable excitation capacity of the superconducting field makes it possible to use air-gap windings with sufficient thickness to withstand the electric stresses.

By combining the construction of an excitation circuit together with winding, a so-called "monolith cylinder armature", a concept in which two cylinders of conductors are enclosed in three cylinders of insulation and the whole structure is attached to an iron core without teeth, it was deemed that a rotating electric machine for high voltage could be directly connected to a power network. This solution implied that the main insulation had to be made sufficiently thick to withstand network-to-network and network-to-earth potentials. Besides it requiring a supraconducting rotor, an obvious drawback with the proposed solution is that it requires a very thick insulation, thus increasing the size of the machine. The coil ends must be insulated and cooled with oil or freones in order to direct the large electric fields into the ends. The whole machine is to be hermetically enclosed to prevent the liquid dielectric medium from absorbing moisture from the atmosphere.

All large generators are normally designed with double-layer winding and coils of equal size. Each coil is placed with the one side in one layer and the other side in the other layer. This implies that all coils cross each other at the coil ends. In high-voltage machines the slots in which the coils are placed in the stator are considerably deeper and typically have 10-12 or up to 18, and in certain cases even more winding layers. The number of coil ends is therefore large with many intersections, which complicates the job of winding and may also cause the coil ends to protrude into the air gap between stator and rotor. Another problem is the increased risk of wear at all the intersection points between the coils.

The object of the present invention is to solve the problem of the large coil-end packages and minimize the number of intersections between the winding coils. This object is achieved by the stator winding, according to the invention, being given the features defined in the claims.

The invention is primarily intended for use with a high-voltage cable of the type constructed from a core having a number of strand parts, a semi-conducting layer surrounding the core, an insulating layer surrounding the inner semi-conducting layer and an outer semi-conducting layer surrounding the insulating layer, and its advantages will be particularly noticeable therewith. It relates particularly to such a cable having a diameter within the interval 20-200 mm and a conducting area within the interval 80-3000 mm^2. Such applications of the invention thus constitute preferred embodiments thereof.

The invention is described in more detail with reference to the accompanying drawings in which;

Figure 1 shows a cross -section through a cable used for the invention,

Figure 2 shows a part of one end of a stator having a plurality of coil ends protruding from its surface, only a few of which are included in the drawing,

Figure 3 shows in radial section one half of an alternating current generator with a stator winding according to the invention,

Figure 4 is a schematic diagram of the winding according to one embodiment of the invention,

Figure 5 is a schematic diagram of the winding according to a second embodiment of the invention,

Figure 6 shows one sector of a stator lamination for a winding according to the invention,

Figure 7 shows a schematic diagram of the winding according to a third embodiment of the invention, and

Figure 8 shows a coil-end package seen radially from the air gap, with a winding according to the invention.

Figure 1 shows a cross-sectional view of a cable 101 used for the present invention. The cable 101 comprises a conductor 102 consisting of a number of strands of copper, for instance, and having circular cross section. This conductor 102 is arranged in the middle of the cable 101. Around the conductor 102 is a first semi-conducting layer 103, and around the first semi-conducting layer 103 is an insulating layer 104, e.g. PEX insulation. Around the insulating layer 104 is a second semi-conducting layer 105. In this case, therefore, the cable does not include the outer protective sheath that normally surrounds such cables for power distribution.

Figure 3 shows in a diametric section one half of a high-voltage generator with a stator 106, a rotor 107 and an air gap 108 between them. Figure 2 shows the inner surface 109 of the stator, facing the air gap 108. The stator 106 is provided with inwardly directed stator teeth 110 defining between them radial slots 111 to hold the cables 101 of the winding. The winding thus forms a large number of layers through the deep slots 111, which in the example shown have place for 12 cables in each enlargement 112. "Layer of the winding" in this context refers to layers at different radial distances from the central axis of the stator. "Stratum" on the other hand refers to strata of the winding at different axial distances from the end surfaces of the stator.

It is clear from Figure 2 how the cable 101 forms coils 113 which pass axially to and fro through the stator 106 and form arc-shaped coil ends outside the end surfaces 114 of the stator. A coil thus consists of one turn of the cable through the stator. A coil group comprises the winding for one phase. The part of a coil group situated in one and the same winding layer, and the coil ends of which are situated in different strata is here designated "coil group part".

Contrary to previously known multi-strata stator windings the coils 113 according to the invention are arranged such that they do not cross each other within the same coil group part. Figure 2 shows a group part comprising, in this case, four coils 113a, 113b, 113c and 113d situated axially, one outside the other and with

substantially coinciding centres. Since the coil 113a has a larger diameter than coil 113b, which in turn has a larger diameter than coil 113c, which in turn has a larger diameter than coil 113d, these coils do not cross or touch each other. This implies that the number of slots 111 that each coil bridges before entering the stator again varies within the group part. The coil 113d thus bridges the least number of slots and the coil 113a the largest number of slots.

Winding is also performed so that, upon passage from the first slot in one direction to the second slot in the opposite direction, the cable in the coil changes position in the slot to the nearest winding layer outside it. The same thing occurs when it returns to the first slot. When all positions in the two slots have been filled, the coils produce a formation reminiscent of a spiral compressed from the sides, stretching from the air gap 108 to the stator yoke 115. The cable then passes to the next adjacent slot to form the next coil, inside or outside, in the same formation.

Figure 4 is a schematic diagram showing how the winding of a cable U1 is performed. In Figure 3 the slots 111 and positions therein have been numbered in corresponding manner to Figure 4. Contrary to the example in Figure 2, each coil group part comprises three instead of four coils. According to Figure 4 the cable U1 starts from position 1 in slot 3, changes to position 2 when it reaches slot 9, then to position 3 when it passes back to slot 3 and to position 4 in slot 9, and so on. This continues until all positions in slots 3 and 9 have been filled, whereupon the coils produced in this way together form the above-mentioned formation from the air gap 108 to the stator yoke 115. As is clear, each coil end bridges 9 - 3 = 6 slots. Winding is continued with the construction of a larger external coil in each turn in the formation, through the cable being conducted to position 1 in slot 2, thence to position 2 in slot 10 and back to position 3 in slot 2, and so on until position 10 in slot 10 has been filled. The coil ends here bridge 10 - 2 = 8 slots and the later coils will therefore be situated outside the earlier coils with substantially coinciding centres. The third coil in this group part is formed by the cable passing to position 1 in slot 1, from there to position 2 in slot 11 and then to position 3 in slot 1 and position 4 in slot 11, and so on. In this case the coil ends bridge 11 - 1 = 10 slots and the coils are therefore the largest in the group part and are situated outermost in the spiral. The coil group described forms the winding

for one phase in the generator. The other phases are constructed in similar manner.

Figure 5 shows a second embodiment of the winding according to the invention. Contrary to the embodiment according to Figure 4, the positions 1 and 2 are completely wound in slots 4 and 11, 3 and 12 and 1 and 14, before winding is continued with positions 3 and 4 in the same slots. Winding of these four positions then continues in additional slots. The diagram shows the windings of one phase in a three-phase winding with four coils per slot and four slots per pole and phase.

In the two winding variants described, the number of coils in each coil group part is three and four, respectively. However, the invention is not limited to this, and the number may be anything from two to over ten.

Figures 6-8 show a third embodiment of the winding according to the invention. As can be seen in Figure 6, the positions in the slots have been reversed from those in Figures 3-5 and are numbered radially inwards from the outside. As can be seen in Figure 8, the coil group parts are arranged in relation to each other in peripheral direction such that alternate coil group parts on the way to a layer situated radially further out lie radially inside the next following coil group part and alternate group parts lie radially outside the next following coil group part. Thus, on their way from position 1 in four adjacent slots 111, the coil group parts 116 run radially inside respective adjacent coil groups 117 on their way towards position 2 in four slots 111 bridging seven slots, whereas the coil group parts 117 run radially outside respective adjacently coil group parts 116. This arrangement reduces the growth of the coil end package by no less than 50%.

Figure 7 shows an embodiment of the winding ,according to the invention, known as stepped lap winding. The diagram shows the winding of one phase with the cable U1. As is clear, the cable U1 starts from position 1 in slot 4, forms a coil end to position 2 in slot 11 and then forms the innermost coil in the next coil end group part by passing to position 3 in slot 4, then to position 4 in slot 11, then to position 1 in slot 3, continuing to position 2 in slot 12, and so on. Two coil end group parts are thus formed in parallel, having four coils each, the four coils bridging seven, nine , eleven and thirteen slots, respectively.

Figure 6 indicates the drawing of the cable for two coil group parts in the positions 1 - 4 in slots 1 - 4 and 11 - 14.

The stator winding according to the invention solves the problem of the large coil end package which, if previously known winding technology were used in the high-voltage machines under discussion, would be far too complicated, with a large number of intersections.

Besides the advantage of the reduced radial dimension of the coil end package, the winding according to the invention also provides a cavity which can be beneficially used to hold the coil end package. The cables vibrate during operation, and in order to avoid wear between them they must be reinforced. Regardless of whether such an arrangement is used, a pressure-distributing and wear-preventing curable compound can be used between the cables in the coil.

Article 34 Amdt

AMENDED CLAIMS

1. A stator winding in a rotating electric machine comprising a stator (106) provided with radial slots (111) to hold a winding, in layers at different radial distances from the air gap (108) between the rotor (107) and the stator (106), characterized in that the winding is in the form of a cable wherein the part of the cable (101) that passes to and fro once through the stator (106) between different layers forms a coil (113) with an arc-shaped coil end protruding from each end surface (114) of the stator (106), and in that the coils (113) are divided into coil group parts and that all coils (113) in the same coil group part are arranged axially, one outside the other with substantially coinciding centres and with successively increasing diameters, the number of slots (111) that are bridged by the coils (113) successively increasing within the coil group part.

2. A stator winding as claimed in claim 1, characterized in that the coils (113) produce a formation from the air gap (108) towards the stator yoke (115) since, on passing from the first slot to the second, and also upon returning to the first slot, the cable (101) changes position to the next layer immediately outside until a number of positions in the slot have been filled and then passes to the nearest adjacent slot to form coils (113) that lie inside or outside the cable (101) in the other coils (113) included in the coil group part in the same formation.

3. A stator winding as claimed in claim 1, characterized in that all coils (113) in a coil group part are formed in sequence from the cable (101), the cable only subsequently passing to the next following coil group part to produce the latter.

4. A stator winding as claimed in any of claims 1-3, characterized in that the number of coils (113) in the coil group part is three.

5. A stator winding as claimed in any of claims 1-3, characterized in that the number of coils (113) in the coil group parts is four.

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6. A stator winding as claimed in claim 1, characterized in that the coil group parts (116, 117) are arranged in relation to each other in peripheral direction such that alternate coil group parts (116) on their way to a radial outer layer are situated radially inside the next following coil group part (117) and alternate coil group parts (117) are situated radially outside the next following coil group part (116).

7. A stator winding as claimed claim 6, characterized in that the coils (113) are formed by the cable (101) upon passage from a first slot to a second slot, and also upon returning to the first slot, changing position to the next adjacent layer, and thereafter passing to the nearest adjacent slot and there filling corresponding positions, until two coil group parts have been formed simultaneously between altogether four positions in the relevant slots, whereupon the cable (101) continues in this way until these positions have been filled in all slots (111) of the stator (106).

8. A stator winding as claimed in any of claims 1-7, characterized in that a pressure-distributing and wear-preventing curable compound is provided between the cables in the coil end package.

9. A rotating electric machine, characterized in that it is provided with a stator winding as claimed in any of claims 1-8.

10. A rotating electric machine as claimed in claim 9, characterized in that the winding comprises one or more current-carrying conductors (102), wherein a first layer (103) having semiconducting properties is arranged around each conductor, a permanently insulating layer (104) is arranged around the first layer (103), and a second layer (105) having semiconducting properties is arranged around the insulating layer.

11. A rotating electric machine as claimed in claim 10, characterized in that the first layer (103) is at substantially the same potential as the conductor (102).

12. A rotating electric machine as claimed in claim 10 or claim 11, characterized in that the second layer (105) is arranged in such a manner that it constitutes substantially an equipotential surface surrounding the conductor(s).

13. A rotating electric machine as claimed in claim 12, characterized in that the second layer (105) is connected to a special potential.

14. A rotating electric machine as claimed in claim 13, characterized in that the special potential is earth potential.

15. A machine as claimed in any of claims 10-14, characterized in that at least two of said layers have substantially the same coefficient of thermal expansion.

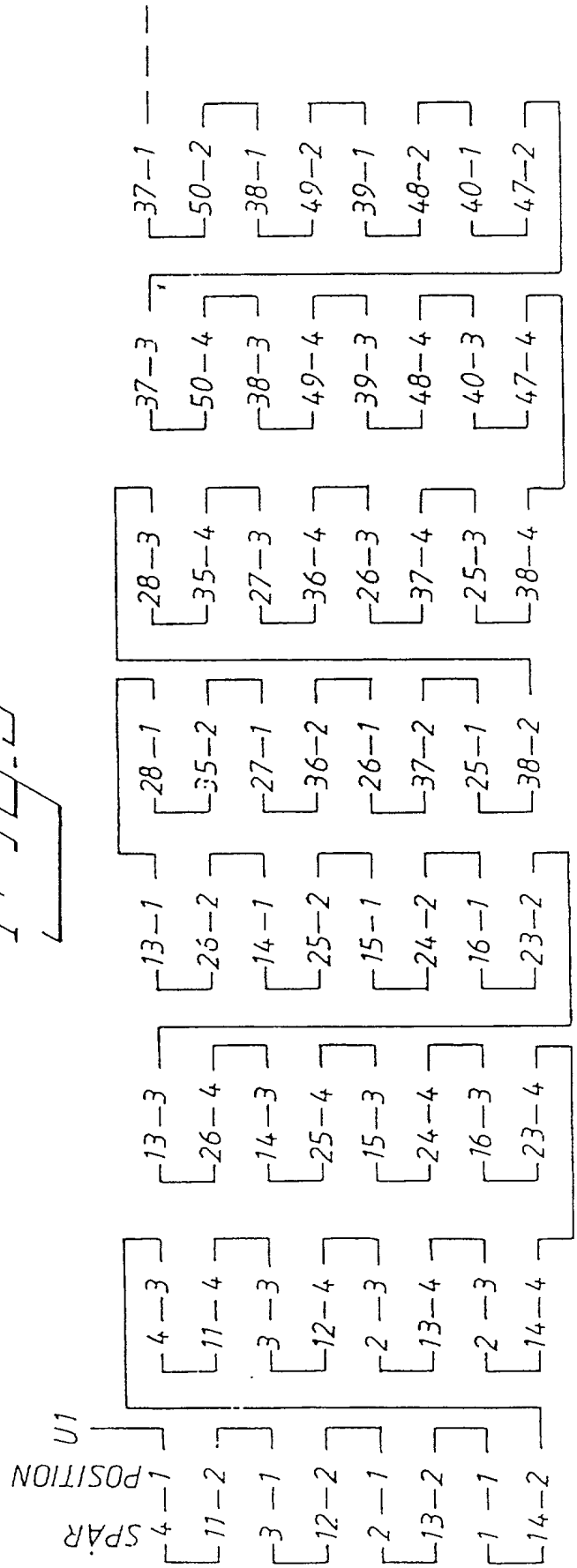
16. A rotating electric machine as claimed in any of claims 10-15, characterized in that the current-carrying conductor (102) comprises a number of strand parts, only a few of the strand parts not being insulated from each other.

17. A rotating electric machine as claimed in any of claims 10-16, characterized in that each of said three layers is permanently connected to adjacent layers along substantially its entire continuous surface.

18. A rotating electric machine as claimed in claim 9 with magnetic circuit for high voltage wherein the magnetic circuit comprises a magnetic core and a winding, characterized in that the winding consists of a cable comprising one or more current-carrying conductors (102), each conductor consisting of a number of strand parts, an inner semiconducting layer (103) being arranged around each conductor, an insulating layer (104) of permanent insulation being arranged around the semiconducting layer (103), and a semiconducting layer (105) being arranged around the insulating layer.

19. A rotating electric machine with magnetic circuit for high voltage as claimed in claim 18, characterized in that the cable is also provided with metal screening and a sheath.

5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3-1
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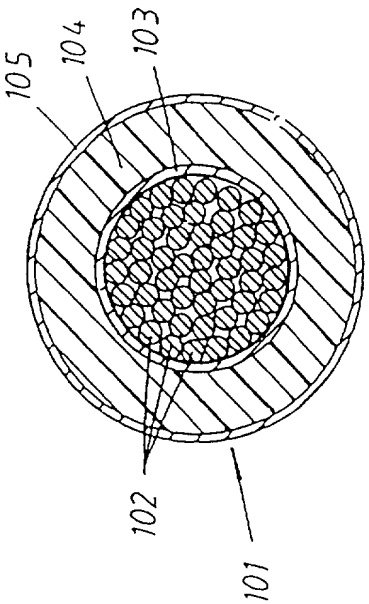
49-2
39-1
48-2
40-1
47-2

FIG. 5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104
103
102
101

FIG. 1

Fig. 2

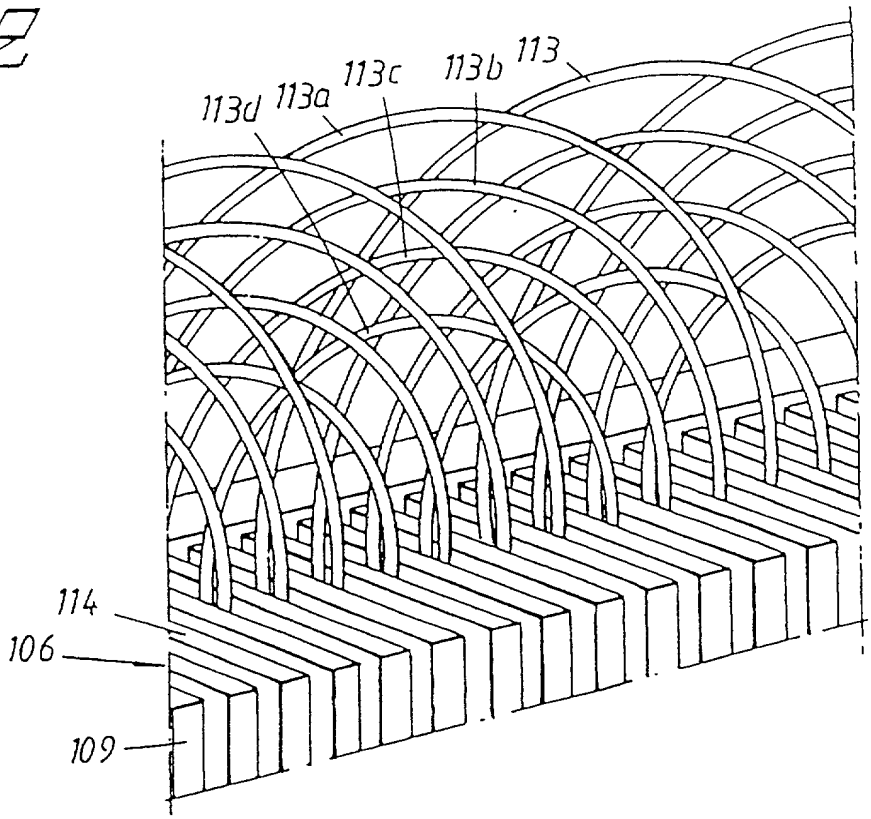
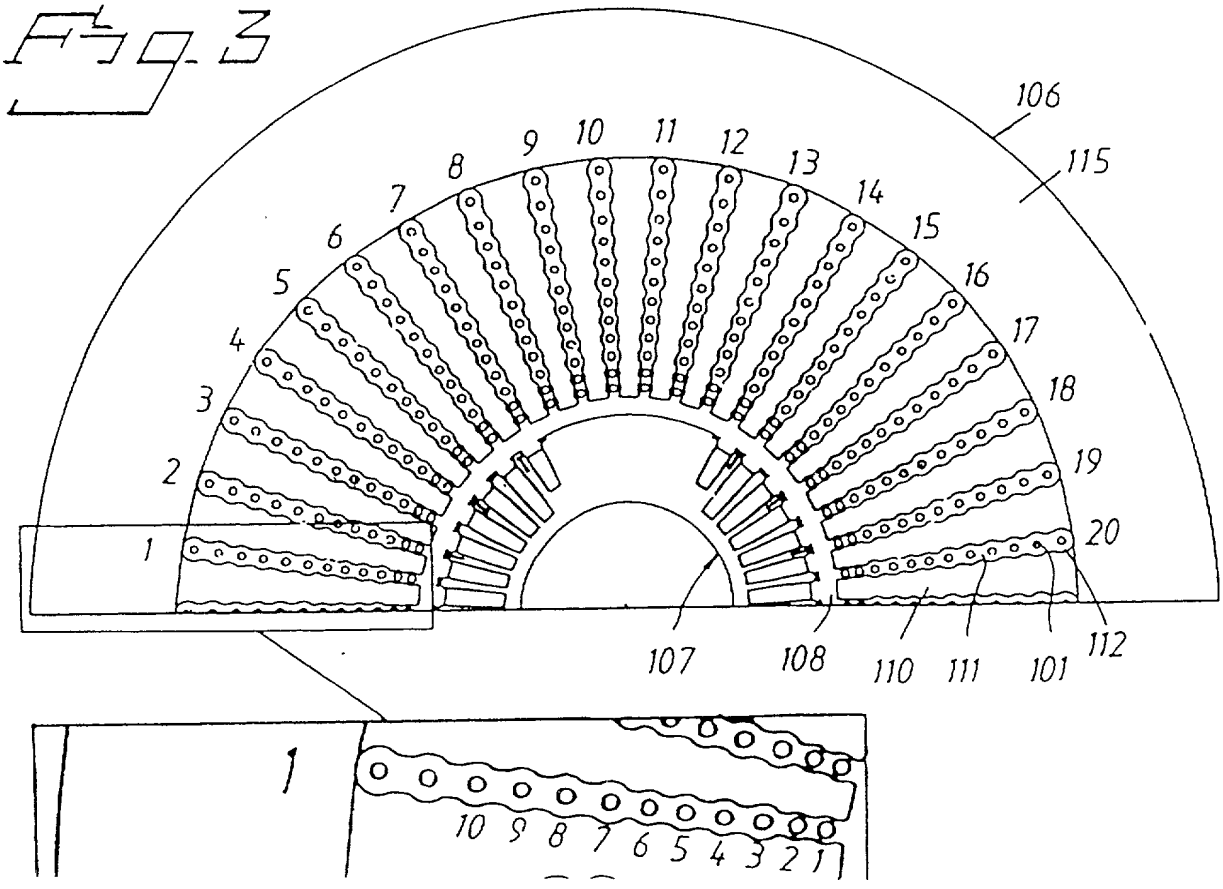

113
113b
113c
113a
113d
114
106
109

Fig. 3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POSITION
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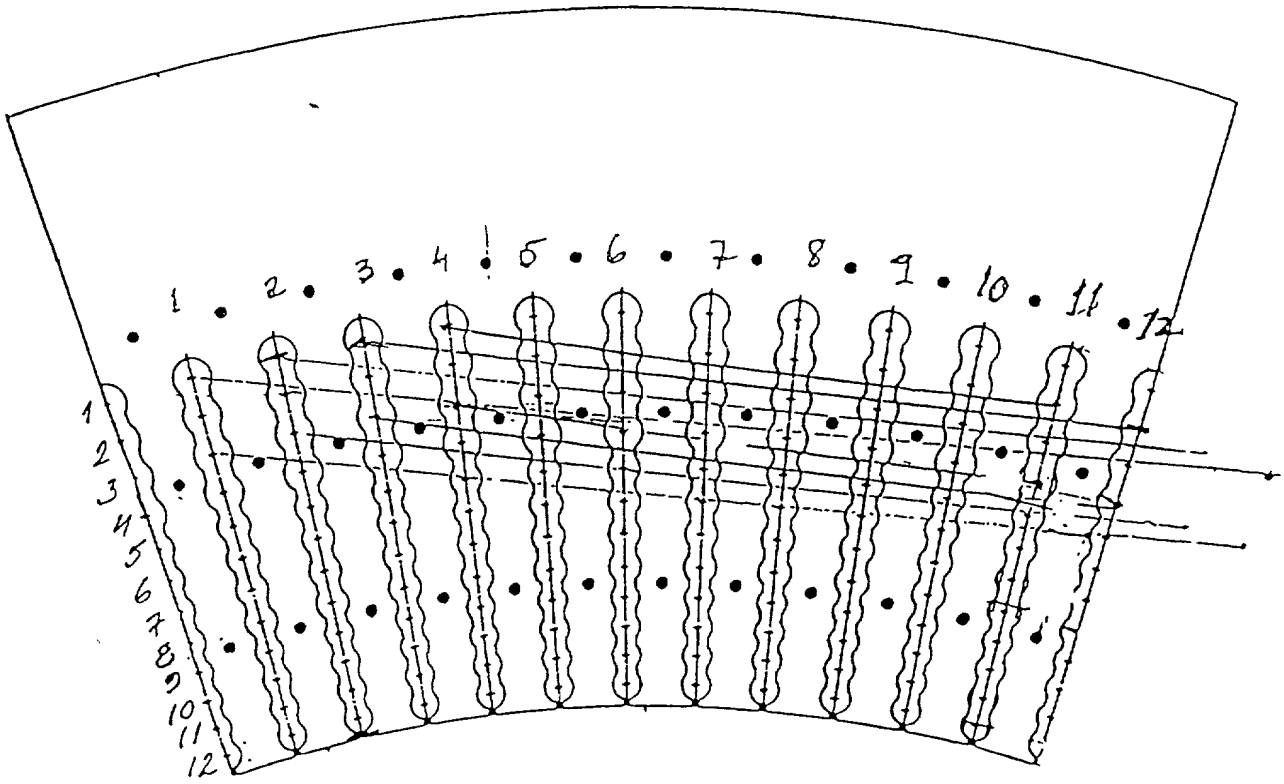
19 9
29 10

Fig. 6



SPÅR
POSITION
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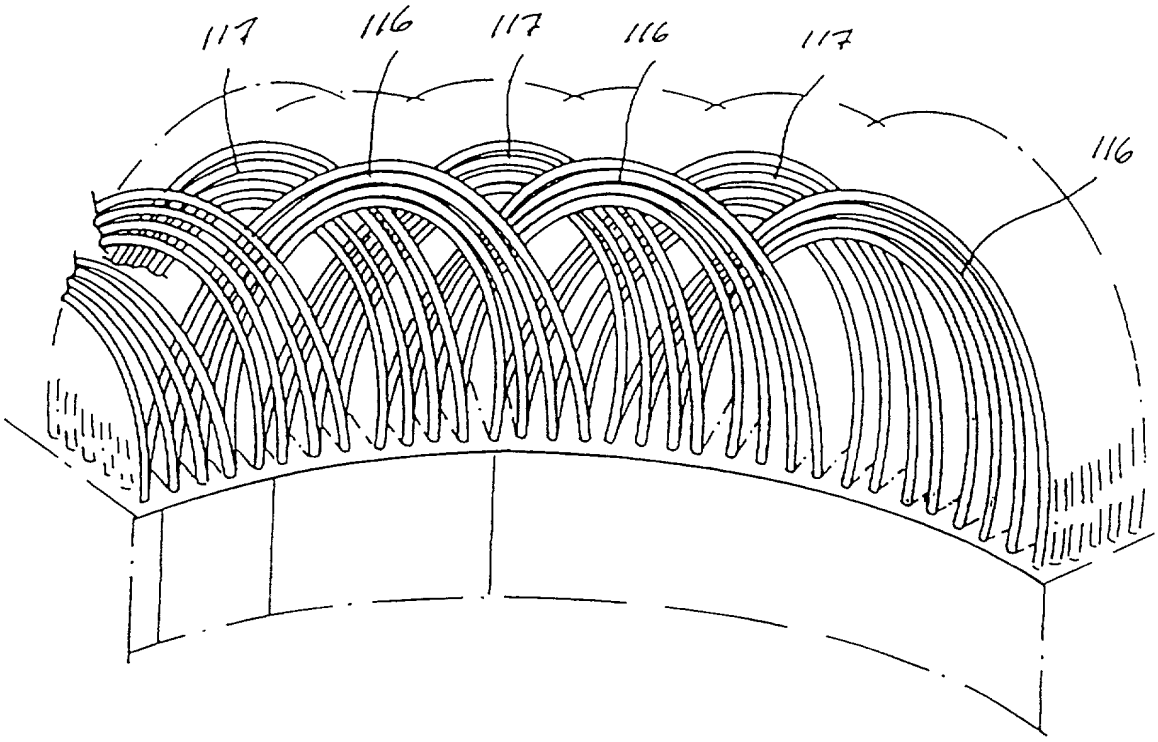
109-3
2 -4
U1

Fig. 8



COMBINED DECLARATION AND POWER OF ATTORNEY FOR UTILITY PATENT APPLICATION (Includes PCT)	Attorney Docket No. 705/71502-2/8036

As a below named inventor, I hereby declare that:
My residence, post office address and citizenship are as stated below next to my name; that

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural inventors are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:
A DEVICE IN THE STATOR OF A ROTATING ELECTRIC MACHINE AND SUCH A MACHINE

the specification of which (check one): [ ] is attached hereto.

[ ] was filed on _____ as Application Serial No. _____ and was amended on _____.

[X] was filed as PCT international application no. PCT/SE97/00905 on May 27, 1997, and was amended under PCT Article 19 on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I do not know and do not believe the claimed invention was ever known or used in the United States of America before my or our invention thereof, or patented or described in any printed publication in any country before my or our invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months prior to this application.

I hereby claim foreign priority benefits under Title 35, United States Code §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application(s) on which priority is claimed:

Prior Foreign Application(s)			Priority Claimed	
9602079-7 (Number)	SWEDEN (Country)	29/05/96 Day/Month/Year Filed	[x] Yes	[ ] No
9602094-6 (Number)	SWEDEN (Country)	29/05/96 Day/Month/Year Filed	[x] Yes	[ ] No
9700356-0 (Number)	SWEDEN (Country)	03/02/97 Day/Month/Year Filed	[x] Yes	[ ] No

I hereby claim the benefit under Title 35, United States Code, §119 (e) of any United States provisional application(s) listed below:

Application No.	Day/Month/Year Filed	Application No.	Day/Month/Year Filed

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating the United States of America listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Application Serial No.	Filing Date	Status (patented, pending, abandoned)
Application Serial No.	Filing Date	Status (patented, pending, abandoned)

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith; Watson Cole Grindle Watson, P.L.L.C.; Lawrence R. Radanovic, Reg. No. 23,077; Richard H. Tushin, Reg. No. 27,297; Donald N. Huff, Reg. No. 27,561; John P. DeLuca, Reg. No. 25,505; Walter D. Ames, Reg. No. 17,913 and Roy W. Butrum, Reg. No. 18,290. Direct all telephone calls to telephone no. **(202) 628-3600** and faxes to **(202) 628-3650**.

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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